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Poultry Production in Alberta

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FACULTY OF AGRICULTURE

Poultry Production in Alberta

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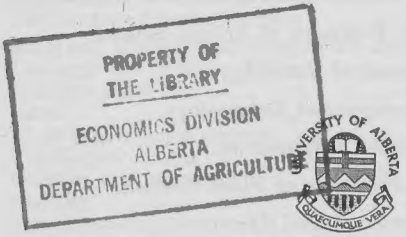

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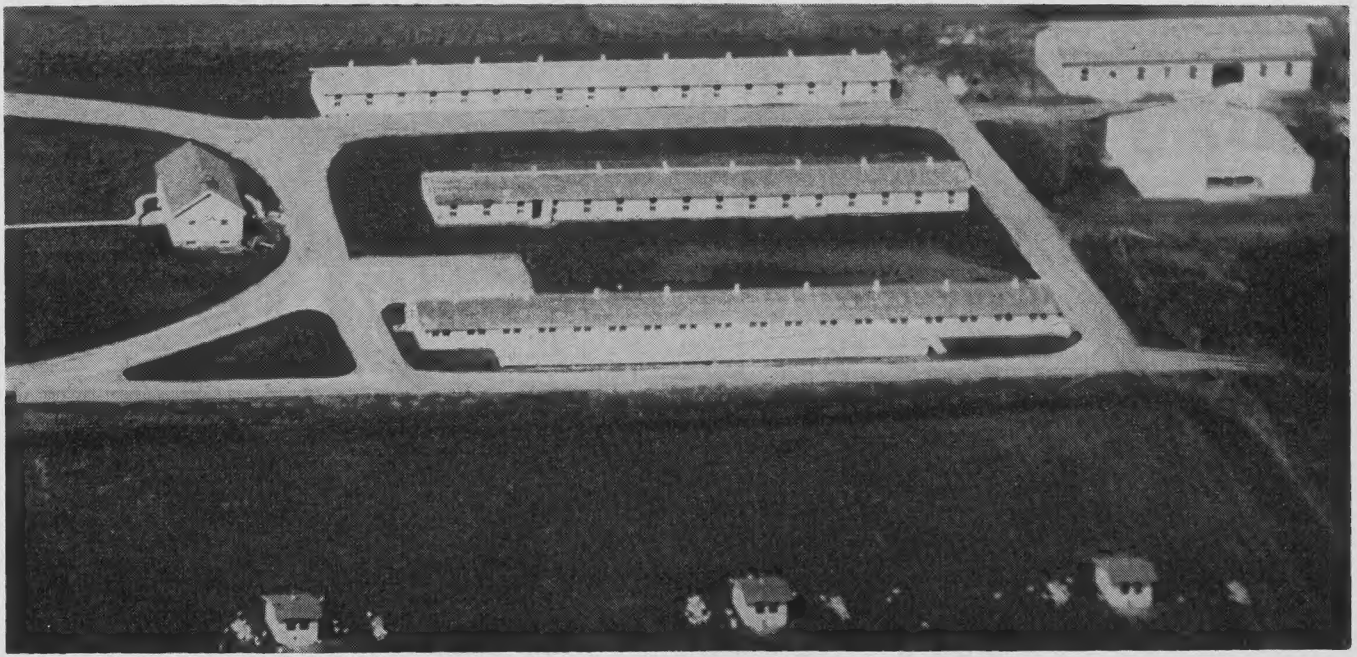


An aerial view of the University of Alberta Poultry Farm.

Poultry Production in Alberta

BY

A. R. ROBBLEE and D. R. CLANDININ

INTRODUCTION

Poultry production today offers an opportunity to the progressive producer. If recent improvements in breeding, feeding and management are utilized, poultrymen can readily increase the efficiency of their production. This increased efficiency will in turn result in higher net returns.

A natural development has been an increase in the number of specialized producers across the country. This specialization has been evident not only on commercial poultry farms but to some extent in poultry enterprises on general farms. On some general farms where poultry was formerly considered to be an unimportant sideline, it now rates as an important source of the farm income. This change has come about largely because of the application of efficient methods of production to the farm flock, and the wider recognition by the general farmer that poultry offer an efficient means of converting farm grains into a cash crop. In most cases the size of operation is smaller than on commercial poultry farms; however, the feeding and management techniques used are similar.

The trend toward specialization has been in progress for some time and has been influenced by factors other than efficiency of production. One of the most important of the "other factors" has been the rapid increase in urban populations. Large urban centres provide the principal outlets for increased production of eggs and poultry meat. As an area becomes more industrialized and the size of cities increases a larger market becomes available. Experience in the United States and Eastern Canada has shown that when this occurs there is expansion and greater specialization in the production of eggs and poultry meat.

A second factor influencing production is the growing public awareness of the importance of the kind of food eaten. Eggs and poultry meat are recognized as "protective foods" in the diet. The term "protective foods" is used for foods that contain a high level of essential nutrients that may be lacking in the ordinary human diet. Eggs, for instance, provide excellent protein and high levels of vitamins and minerals while poultry meat, along with other

meats, is recognized as a good source of protein and certain vitamins and minerals in the diet.

Still another factor that contributes to the popularity of eggs is the fact that they are almost a universal food. They are used widely as a main course for breakfast. They are also used by many as a meat substitute at other meals. Eggs are indispensable in cooking, no one having been successful in producing a satisfactory substitute. There is therefore every reason to believe that the popularity of eggs and poultry meat will continue and will probably increase as time goes on.

THE POULTRY ENTERPRISE

Poultry production in Alberta is still largely associated with the general farm. In many cases the flocks are small and are kept mainly for the purpose of supplying eggs and poultry meat for the family. This situation will likely continue on a great many farms throughout the country and should prove quite satisfactory provided that the number of birds kept is small and that table scraps and surplus milk can be utilized. Quite often, however, the birds are given no particular feed or care, and as a result production rate is very low. The cost of keeping the flock is absorbed by the main farm enterprises. The actual cost of eggs and poultry meat obtained under such conditions may be much higher than the current market price. In addition, the quality of the product obtained is often poor. Often the birds are allowed to run about the barnyard and on manure piles and as a consequence eggs with dark yolks and strong flavours are produced. Eggs may be gathered infrequently and stored at high temperatures with the result that egg quality quickly deteriorates. These practices, of course, should be avoided. There is no use providing the facilities necessary or undertaking the effort involved unless the producer plans to feed and manage the birds efficiently. This applies whether it is the intention to raise just enough birds for home use or whether larger scale production is contemplated.

Economic Aspects

Before anyone goes into poultry production it should be realized that the business has its ups and downs. In general these are related to supply and demand. As in all other phases of agricultural production, periods of prosperity and depression occur in the poultry business. Through the prosperous periods almost everyone raising poultry is able to realize a profit. As a result others are attracted to the business and there is a general expansion of production. Since poultry are easily multiplied this may occur very

quickly. Expansion may continue to the point where the supply of the product exceeds the demand, and since poultry products are perishable the price may drop off sharply. We then move into a period of depression in the industry. In periods of depression only the efficient producer is likely to make money. Most of the people who started in the business during the period of prosperity now hasten to get out of poultry production. As a general rule the "in" and "outers" are in when they should be out and out when they should be in. However, the producer who goes into the business on a permanent basis will be in a position to enjoy the increased returns from the higher prices resulting when the casual producer goes out of the business. It is true that his income may vary from year to year but, in the long run, a fair return should be obtained.

Choosing a Location

Choice of a suitable location for a poultry plant is very important. Since most poultry production on the Prairies is likely to be associated with other types of farming, the general location is already fixed. However, there are several points concerning the location of the poultry buildings and ranges on the farm that should be considered. The permanent buildings should be located fairly close to the other buildings on the farm. Poultry require a good deal of attention. Close proximity to the other buildings will allow the proper care of the flock with as little effort as possible. It has also been observed that loss of stock to predators and by thievery is less if the buildings are reasonably close to the farmhouse and other buildings. As a general rule it is easier to make use of power, water and gas (if available) when the permanent poultry houses are close to the other buildings.

Buildings and ranges should be located on well drained land preferably with a southern slope. It is desirable to have windbreaks around the buildings and on the ranges in order to provide some protection for the birds.

In the case of a commercial producer intending to buy land to start a poultry farming enterprise, attention should also be given to such things as all-weather roads, nearness to market, availability of supplies, proximity to schools and churches and availability of water, light and gas. Water supply is extremely important. In the past few years it has been noted that heavy mortality has occurred on farms were the drinking water is very hard. If possible, the water supply should be tested for hardness. The necessity of giving due consideration to the aforementioned points can scarcely be overstressed.

A permanent shelter belt is an asset to the poultry farm.

Size of Flock

The question of the size of flock to be kept is one that should be carefully considered before going into the poultry business. A number of factors will influence the decision as to the number of birds to keep. These include a consideration of the experience of others, as well as buildings and labor available.

Results of poultry cost surveys have indicated that farm flocks should contain at least three to four hundred laying birds. Flocks of this size, or larger, warrant proper care, and allow a more efficient use of labor than smaller flocks. The income derived from flocks of this size is usually sufficient to assure proper feeding and management of the flock. Flocks of three or four hundred birds are necessary to make use of techniques which have been found to be profitable on commercial farms. These techniques include the installation of automatic feeders and waterers, the use of dropping pits and of community nests and the adoption of the deep-litter system of litter management. These devices tend to improve the efficiency of labor use and remove a good deal of the drudgery from poultry keeping.

Experience has shown that flocks of less than 300 birds are apt to be unprofitable. It takes just about as much labor to look after one or two hundred birds as it does three hundred. In addition, smaller flocks tend to be neglected, particularly during spring seeding and harvest. Neglect of the flock, at any time, usually results in a decline in productivity which may extend well beyond the period of neglect.

Buildings and labor available should also be considered. The size of the farm flock kept may be dependent upon the poultry buildings available or the other farm buildings that are available for conversion to quarters for housing poultry. Availability of labor is also of importance. Expansion into a poultry enterprise on a general farm, as a rule, should not imply the necessity of hiring extra labor, unless the size of the enterprise is large enough to occupy the full energies of another man.

In the case of an individual intending to earn his total income from a laying flock, at least a thousand and preferably two or more thousand layers should be kept. One man can readily look after two thousand laying birds. In the case of a person wishing to make a living from raising broilers, fifty thousand broilers a year should be considered minimal in so far as capacity is concerned.

Land Requirement

The amount of land needed for poultry production may vary considerably. In very intensive rearing, such as broiler production, the amount of land required is no more than that necessary for the buildings provided, and perhaps some allowance for future expansion. If, however, the rearing program involves the use of range then considerably more area will be required. In the latter case, enough land should be available to allow a range rotation, necessary for the prevention of worm infestation and such diseases as coccidiosis. A satisfactory rotation is one in which the land is used one year in three. The actual amount of land needed will vary depending on the type of soil and drainage; the lighter the soil and the better the drainage the less land required. About fifteen acres, divided into three ranges of five acres each, should prove adequate for raising fifteen hundred chickens.

Buildings

General type and location.—The requirements for buildings will vary from farm to farm, depending on the type of operation and the size of flock. In a general farm flock three types of buildings are required. These are buildings for brooding, rearing and laying. **(Plans for brooder, range, and laying houses may be obtained. See page 45.)**

Buildings provided for brooding chicks and for housing laying stock should be insulated. Those for housing birds on range during the summer months may be of single board, open-front construction. As indicated previously it is not necessary to provide new buildings.

The general location of the site for a poultry house (whether a permanent brooder house or laying house) has been indicated. Once

the site has been chosen one must decide the direction that the building will face. As a rule, narrow houses (up to 24 feet wide) are built so that the long axis of the house runs east and west. The windows are usually located on the south side of the building to ensure a maximum amount of light getting into the house. With this arrangement heat losses are held at a minimum, since prevailing winds are from the north and west. However, if the house is deeper than 24 feet the long axis of the house usually runs north and south and windows are provided on both sides.

Insulation.—It is common practice to insulate brooder and laying houses in colder climates. Both ceiling and wall insulation should be provided. Failure to provide insulation will result in many undesirable effects during cold weather. Temperature in the house will fluctuate, the litter will become wet, and the house will be drafty. Proper ventilation cannot be provided without proper insulation.

Many types of insulating material are available. Shavings between the studs (4 inches) and on the ceiling (6 or 8 inches) are quite commonly used and provide satisfactory insulation. A vapor barrier should be placed on the inner side of the insulation. This will prevent condensation of moisture in the insulating material. Waterproof building paper is commonly used for this purpose.

Ventilation.—A good ventilation system provides for the removal of excess moisture while still allowing maintenance of temperature and freedom from drafts within the house. Poor ventilation can be detected in the house by wet litter, condensation and frost on the walls and ceiling of the house or the odor of ammonia in the pens. Failure of the ventilation system to remove excess moisture and ammonia may not be the results of the ventilation system alone, but may be caused by poor construction of the buildings, spilling from waterers, or overcrowding of the pens.

Generally speaking, it is relatively simple to ventilate colony brooder houses and range shelters. In the case of colony brooder houses, during the brooding period, air is usually supplied by opening the windows. Natural circulation of air and removal of moisture is assured by the heat from the brooder stove. Later in the growing period ventilation in the brooder house is provided by removing the windows, while the open-front type of construction used in range shelters assures adequate ventilation in these buildings.

Either natural or forced ventilation may be used to ventilate permanent brooder houses or laying houses. In one system of natural ventilation the air outlets are located along the plate at the front of the house. Air inlets are also provided. Inlets should be

located well above the litter so that the incoming air will be warmed before reaching the birds. A modification of this system is one in which a slot along the length of the house just below the plate serves as both inlet and outlet. Air movement is controlled by adjusting hinged boards over the slot.

A second system of natural ventilation that may be used is the flue system. As a rule, the flue is located at the centre of the pen and extends to the floor on three sides, the remaining side having a sliding door for regulating the amount of ventilation. An opening, with hinged cover, should be provided in the flue at ceiling height to permit removal of head-heat during warm weather. The flue should extend well above the ridge of the building. The flue works on the same principles as a chimney. The warm air in the pen rises in the flue by convection. Suction created at the top of the flue by cross air currents helps to maintain the draft. The portion of the flue above the ceiling should be insulated in order to prevent condensation of moisture in this region. Many flues are much too small for the size of the pens that they service. A rule of thumb that can be used is to allow one square inch of flue area for each two square feet of floor space.

The size and distribution of the air inlets is very important in the flue system of ventilation. Air inlets should be about 60 square inches in area with one such inlet for each 100 to 125 square feet of floor space. In the flue system of ventilation the inlet openings are usually arranged so that the air comes in at the bottom of the studs on the outside, passes up between the studs to enter the pen near the ceiling. In other instances direct openings to the outside just below the ceiling are provided. The inlet openings should be evenly distributed around the pens and should have baffles to deflect the air upward.

Forced ventilation is becoming increasingly popular in poultry houses. This is a positive system of ventilation and is a very satisfactory method of ventilating poultry houses. There are several methods of using fans for ventilation. Fans may be used on the air outlets or on the air inlets. When used on the outlets the fans are usually located close to the ceiling at a point farthest from the heat supply in the pen in order to permit maximum mixing of air in the pen. In some cases a flue from the fan to about 18 inches above the floor is used. Such a duct is, however, not necessary. The air inlets should be small and evenly distributed as in the flue system in order to prevent drafts. All inlets should be at least 8 feet away from the fan outlets.

The size of fan to use will vary depending on the size of the house and the type of stock that is housed. A rule that may be

applied is to provide fans that will remove air at the rate of approximately ⅔ cubic feet per minute (cfm) per square foot of floor space. In cold weather, when the temperature outside is below +10°F., the rate of air removal should be halved (⅓ cfm per square foot of floor space). If two fans are used in the pen, they can be installed so that one operates continuously and the other only when the outside temperature is above +10°F. (For details on the installation of ventilation systems in a laying house see Farm Plan No. 1, Laying House Plan).

Obtaining Stock

Breed.—Many breeds and varieties of chickens are available. Only a few of these, however, have gained much popularity or importance in the poultry industry. These are the breeds that possess the characteristics which are necessary for efficient production. The important breeds might be divided roughly into egg-laying breeds and general-purpose breeds.

The Mediterranean breeds are generally referred to as the egg-laying breeds. Of these, only one, the Single Comb White Leghorn, has attained very wide acceptance in the commercial field. The White Leghorn is one of the more popular breeds of chicken in Canada today. This is because of the fact that it excels most other breeds in productivity, efficiency of feed conversion, fertility and hatchability. The Leghorn lays white shelled eggs.

The general-purpose breeds are those that, in addition to being fairly good egg producers, are also good producers of meat. They are popular on general farms. Of the general-purpose breeds the most important are the Barred Plymouth Rock, Light Sussex, New Hampshire and the White Plymouth Rock. The general-purpose breeds lay brown shelled eggs.

In addition to the so-called egg-laying and general-purpose breeds, breed crosses, strain crosses and strain selections are available that have been shown to be highly efficient from the points of view of hatchability, livability, egg or meat production and feed conversion. However, in this regard, only proven breed crosses, strain crosses or strain selections should be considered.

Quality.—The quality of stock raised is very important. The purchase of high quality stock is one of the best investments that a poultryman can make. The best feeding and management in the world will not make birds produce that do not have the inherent ability to do so. Therefore, in obtaining stock for laying purposes, it is of prime importance that the poultryman should seek stock that possesses the inherent ability to live and to produce eggs of

high quality throughout the laying year. In the selection of stock for broiler production such points as white plumage, rapid growth, early feathering, good fleshing, high livability and efficiency of feed conversion are important considerations. Obtaining stock from the same source that has satisfied producers already established in the business is usually a safe practice.

Where to buy.—Wherever possible it is best to buy chicks from a local hatcheryman, provided that he has the type of stock that you desire. The advantage of purchase from a local hatcheryman is that trouble, often the direct result of overheating, chilling or time delay in shipping, may be avoided. One should be able to learn from the hatcheryman the source of the stock, so that more can be found out about its breeding and past performance.

Sexed or mixed chicks.—Poultrymen often wonder whether to buy sexed pullet chicks or mixed chicks. When one takes into account the higher price that is paid for pullet chicks as compared to mixed chicks, it costs a little more to raise pullets from sexed pullet chicks than from mixed chicks. However, many poultrymen feel that the quality of the pullets obtained from sexed pullet chicks is slightly better and perhaps justifies the extra cost. If brooding space is limited it is advisable to buy sexed pullet chicks. If, on the other hand, ample brooding space is available one might just as well buy mixed chicks, raise the cockerels for broilers or capons and lower the cost of producing the pullets for the laying house.

Number for replacement.—The number of chicks to buy for replacement purposes will depend on the percentage of the laying flock to be replaced, expected mortality during the growing period and the quality of stock obtained. In order to control losses from diseases, such as Fowl Tuberculosis (See Bulletin No. 45, Diseases of Poultry), many flock owners now are replacing 100 per cent of the laying flock each year. Even when such diseases are not a problem, many poultrymen find that it is sound practice in the case of heavy birds to replace the entire flock each year. In this regard they have found that the cost of pullet replacements is very little more than the return that they obtain from their yearling heavy hens. In addition, they usually know from experience that, in the heavy breeds, pullets make better layers than yearling hens. In the case of Leghorns, however, it is found that the return from the sale of the old birds is low as compared to replacement cost. For this reason many Leghorn flock owners keep the best of the hens over for a second laying year, replacing only ⅔ to ¾ of the flock with pullets.

In buying chicks for replacement purposes it is customary to purchase 2½ to 3 times as many mixed chicks or 1¼ to 1½ times as many sexed chicks as the number of pullets one wishes to house in the fall. The excess should take care of mortality during the growing period as well as those culled in the fall.

Day-old or started chicks.—Most hatcheries now have available for their customers either day-old or started chicks ranging in age up to about four weeks. Some producers prefer started chicks since they are already past the very critical brooding period and as a consequence require less attention on the farm. Early mortality is also eliminated as far as the producer is concerned. Generally speaking it is desirable for experienced operators to purchase day-old chicks. An experienced operator can usually brood chicks at less cost than the price charged for brooding in the hatchery. Perhaps of more importance is the fact that there is less hazard from disease if the chicks are purchased as day-old and raised on the farm.

Ready-to-lay pullets.—A few poultrymen purchase ready-to-lay pullets for their replacement needs. This may be done because of lack of land or because the operator feels that he can devote his time more profitably to the laying flock. As the industry expands and becomes more specialized there will likely be a place for operators whose main business is to raise replacement pullets for sale to other poultrymen.

When to buy chicks.—A decision as to the time of year to purchase chicks depends upon the facilities available for brooding and rearing and should take into account the seasonal variation that occurs in the price of eggs. The variation in egg prices is related to production trends. The bulk of the chicks are purchased in April and May. These birds come into lay in October and November and are producing at a high rate by December. While they are in heavy production egg prices remain low. As summer approaches production decreases and an increase in egg prices occurs. If a producer buys chicks in April or May, it is likely that he will find that his pullets are laying well at the same time as most of the pullets in the country and that the average price he receives for eggs will be low. This can be avoided by purchasing chicks earlier than the average producer. Chicks bought in January or early February should be in peak production by August or early September. This coincides with the period when egg prices are highest. Farmers find too that they have more time to care for the early hatched birds. While it is true that a little better housing is required for early chicks and the fuel cost for brooding is higher, the premium prices received for fall eggs should more than compensate for these

extra costs. The time of year to purchase chicks must rest on the poultryman's own decision. Experience has shown, however, that early hatched chicks are usually the most profitable.

BROODING AND REARING

Brooding and rearing involves a combination of housing, feeding and management of chicks from hatching to the age at which they are marketed or reach maturity. The ability of the poultryman to provide proper care and comfort for the chicks, particularly during the first few weeks of life, is essential to the ultimate success of the poultry enterprise. However, the knowledge of brooding and rearing has developed to the point that, today, even an inexperienced operator can achieve success by following rules.

Systems of Brooding and Rearing

Brooding of chicks is, in essence, housing plus temperature control. Three types of housing are commonly used for the brooding of chicks. They are as follows:

(1) the colony or portable brooder house

(2) the continuous, or permanent brooder house

(3) the battery brooder.

The systems of brooding associated with the use of these three types of housing have been referred to as the colony system, the permanent brooder house system and the battery brooder system of raising chickens.

The colony system.—The colony system of brooding chicks is used most commonly. This system involves the use of small portable houses. These brooder houses are usually located about 200 feet apart on range and are moved at three or four week intervals during the rearing period.

Colony brooder houses.

Brooder houses vary in size and shape, but in general are 10′ × 12′, 10′ × 14′ or 12′ × 12′ in dimensions. (See Farm Plan No. 2, Brooder House). Houses larger than this should be avoided because they are difficult to move on range.

Colony brooder houses are usually heated with coal, oil or propane gas. Electrically heated or natural gas fired brooder stoves are not suitable since colony brooder houses are generally located on range at some distance from a source of power or gas supply. A few operators bring their brooder houses in close to the other buildings and do make use of either natural gas or electricity for early brooding. By doing this, the care of the chicks is centralized and the labor requirement is reduced.

A 10′ × 14′ brooder house is suitable for starting 250 to 300 chicks The operator should not attempt to start more than 300 chicks in a house of this size. Overcrowding in the brooder house usually results in poor rate of growth and lack of uniformity. In addition, excessive losses may result from smothering, cannibalism or disease in groups of chicks that are overcrowded.

The colony system of brooding and rearing chicks when properly managed is very satisfactory. Birds raised with access to green range and sunlight are less likely to suffer from nutritional deficiencies than birds raised in confinement. The hazard from disease is reduced when proper use is made of range. Rotating the ranges so that the ground is used only one year in three and frequent moving of the houses during the brooding and rearing period results in a decrease in exposure to infection. The net result is that range

Arrangement of houses on range.

reared birds are usually hardy, vigorous and have a good reserve of nutrients when they are moved into the laying house.

The permanent brooder house system.—This system of brooding and rearing chicks makes use of a permanently located brooder house rather than a number of portable colony units. It is a confinement-rearing proposition. The houses used resemble laying houses in construction and are sometimes provided with a sunporch. In some instances the pen size is large while in others the pen area is comparable to colony brooder house units. The use of the permanent brooder house system has become more common on broiler plants and poultry farms where brooding is not confined to a single season of the year.

The method of heating permanent brooder houses varies considerably. In some cases the necessary heat is supplied by separate brooders in each pen; in others a central heating system of hot water, steam or heated air to provide a temperature of 70° to 75°F. is installed and auxiliary heat is supplied by continuous hot water hovers, gas or electric hovers or infra red lamps; in still others the use of radiant heating is employed. The latter is a heating system where hot water pipes are installed in the concrete floor and the temperature is thermostatically controlled.

It is difficult to compare the relative merits of the three general means of heating permanent brooder houses. The use of the individual hovers in each pen perhaps represents the lowest investment and is satisfactory provided that the house is well insulated and a cheap, convenient source of heat, such as natural gas, is available. With this type of heating, dampness in the house and wet litter are sometimes encountered, particularly in cold weather or if the house is not full. As a result, many of the plants recently established have a central heating system to provide most of the heat required. This allows better ventilation in the house and more satisfactory operation, particularly if the house is not being operated at full capacity. The use of radiant heating has only recently come into prominence. Reports as to its usefulness are varied. Its chief advantages are: fuel costs are lower, dry litter is easily maintained and fluctuations in floor temperature take place slowly. The chief disadvantages are: the cost of installation is high and litter tends to become very dusty.

As time goes on and the poultry industry on the Prairies becomes more intensified, the permanent brooder house system will likely become more popular. There is no doubt that this system requires less labor than the colony system of brooding. In growing pullets for the laying house, however, many operators feel that the use of

range is necessary for the production of hardy, vigorous layers. As a result some operators raise their chicks in permanent brooder houses until they no longer require artificial heat and then transfer them to cheaply constructed shelters on range. It should be remembered, though, that the investment in a permanent brooder house is high and that, to be economical, it should be used more than once during the season. The fixed location of a permanent brooder house and its use several times a year for brooding chicks may increase the hazard from disease as compared to the colony system. Strict sanitation should be practised if trouble is to be avoided. (A

A battery brooder used for starting chicks.

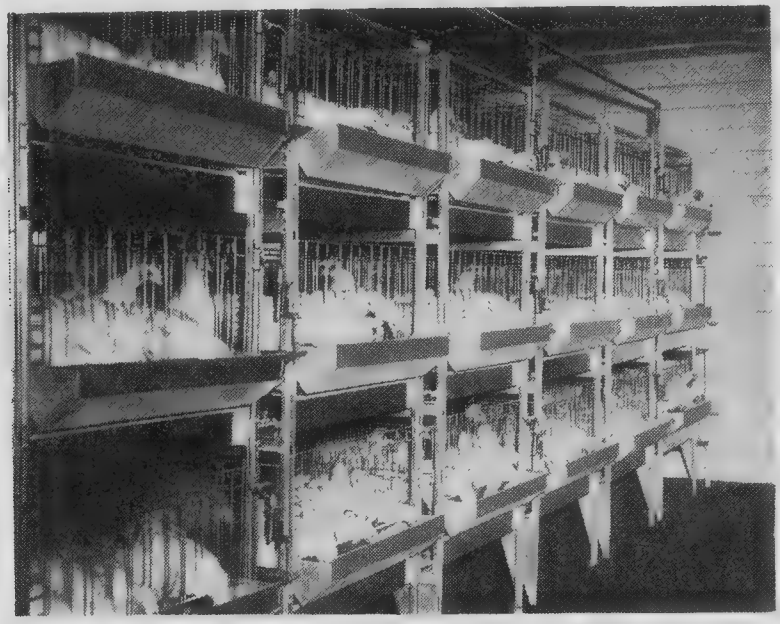
section on sanitation is included in Bulletin No. 45, Diseases of Poultry).

The battery brooder system.—This system of brooding chicks is one in which the chicks are raised in batteries. Many different types of batteries are available. Usually they have several decks with wire floors and dropping pans below. In the type designed for starting chicks, heat is generally supplied by electrically heated elements with thermostatic controls which allow good control of temperature. In the type used for growing or rearing birds, no auxiliary heat is supplied but the batteries are located in buildings where the room temperature is held around 60° to 70°F.

The battery system is a very intensive system of raising chicks and permits brooding and rearing of a large number of birds in a limited space. Consequently, this system is used widely by hatcheries to hold surplus chicks and to raise them for sale as started chicks. This system is also used on some broiler plants and on some commercial poultry farms.

The principal advantage of the system is that it permits brooding large numbers of birds in a limited space with good temperature control. The chief disadvantages are:

(1) The initial cost is high since the batteries must be housed in rooms or buildings which are well ventilated and warm.



Growing batteries at the University of Alberta.

(2) The hazard from respiratory diseases such as infectious bronchitis is increased when a large number of birds is housed in one room.

(3) Battery raised chicks frequently grow poorly and suffer high mortality as a result of lack of appreciation on the part of the operator that the space requirement of chicks increases very rapidly as the chicks grow older.

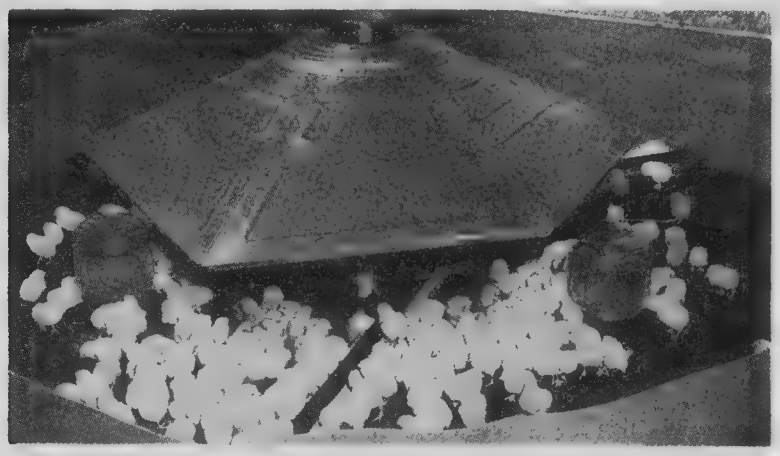
(4) Mortality, in birds that have been raised in batteries and then transferred to the floor, is often high. The mortality may result from piling or from inability to adjust to the new conditions.

Feeding and Management During the Brooding and Rearing Period

Cleaning the brooder house.—The brooder house should be thoroughly cleaned before the chicks arrive. Cleaning should start with the removal of litter and droppings from the brooder house. It is desirable to wash down the ceiling and walls so as to ensure that all dirt and dust is removed. The floor should be soaked and adhering litter and droppings removed by scraping and sweeping. Next, the floor should be treated with lye solution (1 can of lye to 5 gallons of water) allowed to soak overnight and finally scrubbed and washed with water. After the house has dried it should be thoroughly disinfected with a reliable disinfectant. The house should not be disinfected until it is thoroughly cleaned because disinfectants are relatively ineffective on dirty surfaces. All equipment to be used in the house should also be thoroughly cleaned and disinfected. Following cleaning and disinfecting, the house should be given a good coat of whitewash. Whitewash may be prepared by slaking one bushel of quicklime in twelve gallons of water, dissolving two pounds of common salt and one pound of zinc sulfate in two gallons of boiling water, pouring this mixture into the slaked lime, adding two gallons of skimmilk and mixing thoroughly.

It is desirable that the above operation be carried out in the fall after the young stock is moved to laying quarters. Following cleaning, the brooder house should be moved onto the clean range that is to be used the following year.

Brooder operation.—The brooder stove should be set up and put into operation at least three days before the chicks arrive. In setting up the brooder stove, care should be taken to see that a proper chimney jack is used and that the floor is protected against fire by a sheet of hard asbestos or galvanized iron. Check to see that the stove is operating properly and that the temperature can be regulated. If the thermostat wafer does not expand properly it should be replaced. Control of temperature is essential in the



Starting the chicks.

Note arrangements of feeders and waterers. Chicks are confined close to the brooder by a guard ring. (After Canada Department of Agriculture).

brooding program, since the day-old chick is easily affected by chilling or overheating. The brooder should be capable of maintaining a temperature of 95° to 100°F. at the edge of the hover, 2 inches above the litter. The accuracy of the brooder thermometer should be checked against a clinical thermometer.

As the chicks age they require less heat. The brooding temperature should be reduced about 5°F. per week until it is down to 70° to 75°F. when the chicks are 5 to 6 weeks of age. At this time heat may be discontinued if weather conditions permit; however, it is often advisable to leave the brooder stove in the house for an additional week or two in case the weather turns cold.

The temperature of the house should not be as high as under the hover. A room temperature of 70° to 75°F. is quite satisfactory for small chicks. The room temperature may be reduced to 60° to 65°F. by the time the birds are 6 weeks old.

The behavior of the chicks indicates whether or not brooding room temperatures are correct. If the chicks are cold they will chirp and huddle together under the hover. Such chicks may develop diarrhoea and suffer high mortality which may continue for several days after chilling has occurred. The effects of overheating may be just as serious. Overheated chicks tend to move away from the hover. Mortality will vary depending on the degree of overheating.

Litter.—A number of materials may be used as litter. Those most commonly used on the Prairies are wheat straw, shavings, peat

moss or a combination of these. If straw is used, care should be taken to avoid using musty straw, as the use of moldy litter for poultry often results in an outbreak of Aspergillosis (see Bulletin No. 45, Diseases of Poultry). Peat moss, while very absorbent, tends to be dusty. Shavings, on the other hand, are not too absorbent.

Some operators like to use burlap over the litter during the first few days of the brooding period. This is done to prevent the chicks from eating litter. It is not advisable to use newspaper in place of sacking since newspaper is slippery and may cause leg disorders.

During the first week of brooding, the litter under the hover should be removed daily. Later, weekly cleaning of the litter will suffice, and when the birds are outside most of the day, cleaning every two weeks will be found adequate. As aids to keeping the litter in good condition, daily stirring is recommended and water spillage should be kept at a minimum.

Floor space requirements.—For success in brooding, it is necessary to provide each chick with enough floor space. Tests have been conducted which show that chicks should have approximately ½ square foot of floor space per bird to 4 weeks of age. The amount of floor space provided per bird should be doubled at four to six weeks of age. This can be done by separating the cockerels from the pullets. With chickens raised in confinement, the floor space provided should be increased to 2 square feet per bird at 12 weeks of age and to 3 square feet of floor space per bird at 16 weeks of age.

Ventilation.—During the first few days of brooding, little ventilation, other than that provided by opening and closing the door, is needed. As the chicks age, more ventilation should be provided by opening the windows. On sunny days, care should be taken to see that sufficient ventilation is provided to avoid overheating in the house. When the birds are off heat, and weather permits, the windows should be replaced by wire screens to provide maximum air movement through the house.

Feeders and waterers.—From day-old to 4 weeks of age, chick size feeders should be used. Initially 1 foot of feeding space should be allowed for each 10 to 12 chicks. In other words, at least 4 three-foot feeders should be provided for each 250 to 300 chicks. At 3 to 4 weeks of age, intermediate size feeders should be introduced and the feeding space allowed should be doubled. Care should be taken to see that the birds at all stages of growth have enough feeding room, since a common cause of cannibalism in growing birds is failure to provide enough feeding space.

It is also important to see that there is an adequate supply of water for the chicks. At the start, 4 one-gallon fountains will supply

Automatic water fountains greatly reduce labor requirements on the poultry farm.

the water required by 250 to 300 chicks. The water fountains should be distributed about the pen so as to be readily accessible. Initially, they should be placed on the floor, but as soon as the chicks learn to use them, they should be placed on low wire stands to prevent the chicks from coming in contact with the damp litter which is usually found around fountains. At 4 weeks of age larger fountains should be introduced. (A fountain that may be adapted for use by chickens of all ages is illustrated on a poultry equipment plan. See Farm Plan No. 4, Poultry Equipment).

Feeding.—It is usual practice to feed chicks a good chick starter until they are 4 to 6 weeks of age. Starters are formulated so as to meet the nutrient requirements of the chick. Some people, in an effort to improve the ration, feed skimmilk, buttermilk, oyster shell, ground limestone, bonemeal or grain during this period. This tends to throw the ration out of balance with respect to minerals, protein or vitamins and poor results may be obtained. Chick starter should be fed as the sole feed. In addition to chick starter the chicks should receive chick size insoluble grit as an aid to utilization of the feed and development of the gizzard.

During the rearing period, 6 weeks to sexual maturity, one of two systems of feeding, namely the free choice feeding of growing

mash (or concentrate) and grains or the restricted feeding of mash and grain, may be followed.

In the free choice feeding of mash (or concentrate) and grain the birds are allowed to make a free choice selection of the mash (or concentrate) and grain which are supplied continuously. Initially, the birds eat heavily of the mash; however, as the birds grow older they consume proportionately greater amounts of grain as compared to mash. In this way the birds meet their protein requirements which is 20% during the first 6 weeks and decreases to 14% by the time the birds begin to lay. As the proportion of grain consumed increases, the proportion of mineral eaten is also reduced. In order that the birds can balance their diet with respect to mineral intake, oyster shell should be supplied free choice. Free choice feeding of oyster shell should always be practised when scratch grain is fed to the birds. In some cases a supplementary source of phosphorus should also be supplied. This may be done by giving the birds free access to bonemeal. During the rearing period, the chick size grit should be replaced by intermediate size grit.

In the system where restricted feeding is practised, the poultryman limits the intake of both mash and grain by the growing chickens. Under this system the birds are forced to get some of their food requirements from the consumption of green range. Advocates of the system claim that restricted feeding results in bigger, slightly later maturing birds that lay larger eggs and have less mortality. The system, however, is not recommended where the birds do not have access to green ranges.

Feed consumption.—The amount of feed that will be consumed during the starting and growing periods will depend to some extent on the type of ration that is fed and the mature size of the birds. A thumb rule that may be used for estimating feed requirement is as follows:

Starting ration—2 lb. of starter for each chick purchased should take care of the feed needed to 4 to 6 weeks of age, at which time the chicks are usually placed on growing feeds.

Growing feeds—20 to 25 lb. of feed is required to raise a pullet from 6 to 20 weeks of age. Lighter breeds such as the Leghorn require the lesser amount, and heavier breeds such as New Hampshires and Plymouth Rocks, the greater amount. This feed, as previously indicated, consists of growing mash and whole grain.

Getting the chicks out of doors.—Weather permitting, it is desirable to get the chicks out of doors by the time they are 4 to 6 weeks of age. When they are first let out it is necessary to confine the

chicks to a small area in front of the house with wire netting so that they will learn to go in and out of the house by themselves. The enclosure should be gradually enlarged until by the end of a week the barrier can be removed. By this time, the chicks should have learned to get back into the house by themselves.

An open-front range house.
Used for birds that no longer require auxiliary heat.

Separating the cockerels and pullets.—The cockerels and pullets should be separated when they are 4 to 8 weeks of age. Lightweight breeds may be separated at the younger age, while it is usually not possible to separate the sexes of heavy-weight breeds until they are 6 to 8 weeks of age. When chicks are brooded in permanent brooder houses, the separation is made when the birds are moved to range at 6 to 8 weeks of age. The separation of the sexes gives the birds the extra room required, and permits better development of the stock. If the males are left with the females the males tend to dominate and the pullets do poorly.

Alternation of ranges.—In a program of range rearing it is important to have a rotation of ranges. Experience has shown that a three year rotation is very satisfactory. In a three year rotation the young stock is placed on range that has not been used by poultry for two years. Under this system of management, losses

from worm infestation and such diseases as coccidiosis are low. Mortality from diseases and parasites can often be traced directly to allowing the growing stock to run about in yards or ranges where poultry have been kept for many years.

Range crops.—A variety of range crops is used in Alberta. These vary from annual crops such as oats or rape to pastures of permanent grasses and legumes. Alfalfa or clover pastures have been very popular and if properly managed provide good range.

It is essential in the management of range to see that the growth does not get too mature. Immature plants provide a high level of vitamins and protein. If the range is mowed often and new growth is maintained, the growing chicken can obtain many essential nutrients from the range. This in turn makes possible the feeding of a cheaper type of ration than would be possible if good range was not provided.

Moving the brooder and range houses.—The brooder houses or range shelters should be moved at least once a month. This serves a number of purposes. It moves the chicks away from a heavily contaminated area on to clean ground which is necessary in a sanitation program. In addition it prevents killing of the grass under the houses which would result in bare spots on range the following year.

THE LAYING FLOCK

Housing

The laying house should be designed to provide maximum comfort for the birds throughout the laying year. (See Farm Plan No. 1, Laying House Plan.) In this regard it is important that the house should be well insulated so as to avoid extreme and sudden variations in temperature. Although the hen can adjust to temperatures considerably lower than 50°F., the house temperature should not fall much below this level if dry litter is to be maintained. In order

A laying house at the University of Alberta.

to maintain at least 50°F. during very cold weather, it is necessary to provide supplementary heat in the house.

A good ventilation system is needed to keep the pens dry and to remove odors from the house. Good ventilation implies good air movement in the house with freedom from drafts.

Floor space requirements.—The laying house should be used to capacity as much as possible. Full capacity operation reduces the overhead chargeable to each bird. The amount of floor space that should be allotted to each bird will vary depending on the size of the pen, the breed of chicken, and the ventilation system employed. Generally speaking, heavy breeds should be allowed 3 to 4 square feet of floor space per bird, while light-weight breeds should be provided with 2½ to 3½ square feet of floor space per bird. By providing forced ventilation, and ample feeding and watering space,

Laying battery.
Birds are kept in individual cages during the laying year.

some operators have been successful in reducing the floor space required to 2 square feet per bird. Competition among the birds for feed and water supply is increased as the floor space per bird is decreased. To offset this effect the amount of feed and water space should be increased in proportion to the number of birds in the pens.

It is a common tendency on many farms to try to house more pullets than is justified by the amount of space available. One of the first indications of overcrowding is wet litter in the house, since most ventilation systems are unable to remove the additional moisture from the extra birds. Overcrowding may also cause severe outbreaks of cannibalism in the flock, resulting in heavy losses to the producer. It has been previously indicated that some producers have been successful providing as little as 2 square feet of floor space per bird. In these instances, cannibalism has been avoided by debeaking or using anti-picking devices such as "hen specs".

Equipment

The equipment in the laying house should be arranged to allow the operator to care for the birds with a minimum amount of labor. Since the main labor output on the average poultry farm is for feeding and watering the birds, gathering the eggs and cleaning the house, the labor input can be reduced by:

(1) Installing automatic waterers. In this regard, commercial waterers are available that operate off gravity or pressure systems.

(2) Using automatic feeders. If this is not feasible, arranging the feeders so that feeding may be done quickly and conveniently will greatly reduce the time required for feeding.

(3) Arranging the nests close to the door so as to reduce the time required to gather eggs.

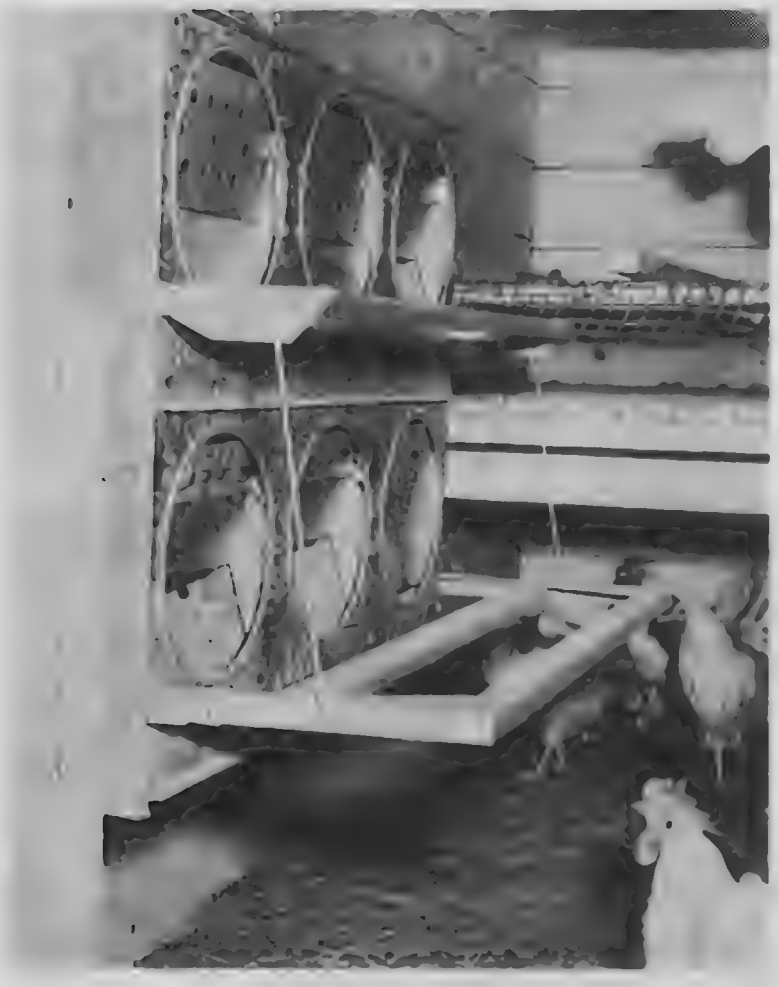
(4) Screening off dropping boards or using dropping pits in order to minimize the time spent in removing droppings.

(5) Using the deep-litter system of litter management.

(6) Making provision for feed storage in the buildings to make feeding easier and less time-consuming.

A certain amount of equipment is needed in the laying house. The equipment should be convenient and durable but not necessarily expensive. The principal items required in the laying house are nests, feeding equipment, waterers, roosts and broody coops.

Nests.—Some operators prefer individual nests while others prefer community-type nests. Where individual-type nests are used, it is important to construct them in tiers and in such a manner that the birds enter them from the rear. The latter will tend to



Individual nests with trap-fronts.

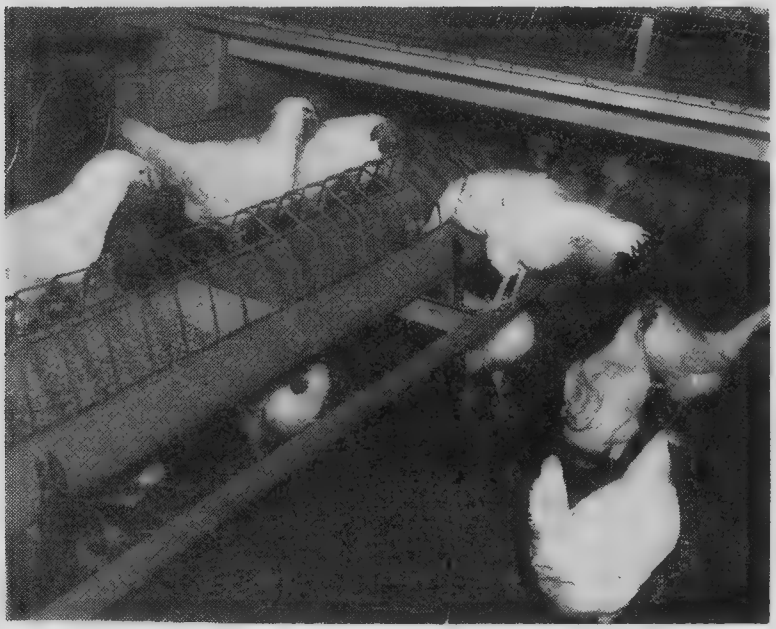
decrease trouble from egg eating and cannibalism. Regardless of the type of nest used, the nest banks should be located at convenient height to the birds and near the door end of the pen to reduce the time required for gathering eggs. Some operators centralize their banks of nests in nesting rooms to make gathering of eggs easier.

Individual nests are usually about 12″ to 14″ wide, 14″ high and 14″ deep. One such nest should be provided for each 5 to 6 layers. The size of community nests varies greatly. Community nests 2′ × 4′ or 2′ × 6′ are common. Units of this size are easier to keep

clean than larger units. A community nest 2′ × 4′ should be provided for each 50 layers.

Nests, whether individual or community-type, should be built in such a manner that they may be easily cleaned and that a good depth of nesting material may be used. This results in fewer dirty eggs and less egg breakage.

Feeders.—The provision of sufficient feeder space is essential to success of the enterprise. Experiments have shown that high producing flocks should be provided with at least 33 linear feet of feeding space per hundred birds. Feed troughs for laying birds should be about 18″ off the floor and should be provided with reels to prevent the birds from getting into the feed. The troughs are usually about 6″ deep and 8″ wide, have flat or V-shaped bottoms and a lip to reduce feed wastage.



A satisfactory feeder for laying hens.

A recent trend in larger flocks has been toward the use of automatic feeders. Most of these operate on the basis of an endless chain carrying feed along an open trough. Automatic feeders result in a considerable saving in labor but their installation is not considered to be economical in flocks of less than 400 or 500 birds.

Feed storage.—Some provision should be made for feed storage in the building in order to reduce the amount of time required for feeding the flock. An arrangement of overhead bins or central bins in the house is commonly used. Such storage facilities permit the purchase of feed in bulk.

Waterers.—Layers require a constant supply of clean water if good results are to be achieved. The use of automatic waterers in the laying house is desirable and will greatly reduce the labor required in caring for the birds. If automatic waterers are not employed, sufficient water fountains or troughs to supply 3 to 5 gallons of water per hundred birds per day should be used. Waterers should be placed on stands or over the dropping pits if the latter are present in the laying house.

Roosts.—The roosts in the house should be located in an area that is relatively free from drafts, so as to provide comfort for the birds. For this reason roosts are usually located as far from the windows as possible.

The roosts should be built in sections so as to facilitate cleaning of the dropping boards or pits. The perches may be made of 2″ × 2″ material, rounded on the edge and are usually set 13″ to 15″ apart. Six to eight inches of roosting space should be allowed for Leghorns and 10″ to 12″ for heavies. The perches should not be more than 3′ above the floor.

Either dropping boards or dropping pits may be used in conjunction with the roosts. If dropping boards are used they should be made of matched material so as to facilitate cleaning. Dropping boards are generally built in sections and are located about 30″ above the floor. Dropping pits are usually built about 18″ deep.

Whether dropping boards or dropping pits are used, it is desirable to have them screened off so that the birds cannot come in contact with the droppings. Fourteen gauge 1″ × 2″ mesh welded wire or 2″ hexagonal fox wire is very satisfactory for the purpose. Either is more suitable than poultry netting because of durability.

Recently there has been a trend toward the elimination of roosts in the laying house. This system has worked quite satisfactorily, particularly with the heavy breeds. Piling and smothering have been encountered with Leghorns when roosts have not been used.

Management of the Laying Flock

Cleaning the laying house.—Before the pullets are moved into the laying house it should be thoroughly cleaned. The equipment in the house should be removed for this purpose. The equipment and the house should be cleaned, scraped, washed with water and

scrubbed with a lye solution (1 can of lye to 5 gallons of water) and allowed to soak overnight. It should then be washed again with water and disinfected by spraying with a good disinfectant. Any remodelling that is to be done in the pens should be completed at this time. The interior of the house should then be whitewashed using the same whitewash formula as suggested for whitewashing brooder houses (pp. 22).

Following cleaning, the equipment can be arranged in the house so as to have everything in readiness when the birds are to be moved into the house. The litter, nesting material, feed and water should be put into the house before the birds are brought in.

Litter.—There are a number of kinds of litter which may be used in laying houses. The one most commonly used and recommended in Alberta is wheat straw. Wheat straw makes a satisfactory litter, and is usually available at a low price. Shavings or peat moss or a combination of same may be used, but are usually more expensive than straw. Shavings, while attractive, do not absorb very much moisture, and have to be changed often. Peat moss has a much greater moisture holding capacity than either straw or shavings but tends to become very dusty.

The management of the litter is important. In general, there are two methods of managing the litter in the laying house. The conventional method has been to keep the floor of the laying house well covered with clean dry litter which is changed when it becomes damp or dirty. This procedure necessitates removal of litter at least every two weeks during the winter and once a month during the summer. A newer method of litter management, and one that has received wide acceptance in commercial flocks, is the use of the "deep-litter" or "built-up litter" system of management. In this system of litter management four to six inches of litter is placed in the laying house prior to housing the pullets. It is usually recommended that this be done in August or early September so that fermentation will commence before the weather becomes too cold. Clean litter is added at intervals until the litter is eight to ten inches deep. Once this depth has been reached, further additions are not necessary, but the litter should be stirred occasionally. Under this system of management the litter, if properly handled, needs to be changed only once a year. If the litter becomes wet, the addition of hydrated lime is recommended. The hydrated lime should be added at the rate of 10 to 25 lb. per 100 square feet of floor area and should be will stirred into the litter.

The success of this system depends upon getting a sufficient depth of litter to allow fermentation to occur. The fermentation along with

the insulating properties of the litter results in the surface of the litter being warm and thus reduces condensation of moisture on the floor.

The main advantage of the deep litter system of management over the conventional system of litter management is that it reduces labor required in caring for the birds. In addition, it has been found that certain nutrients required by the chicken, notably vitamin B_{12}, are produced in deep litter, although chickens should not be dependent upon this source of nutrients.

Time of housing.—It is very important that the birds be carefully handled at the time they are moved to the laying house. Rough handling may result in frightened birds that fail to adapt themselves to confinement. The pullets should be housed just as they are coming into lay. They may be left on range until they are laying at a rate of about ten per cent. It is risky to leave them on range until they are laying at a rate of 25 to 50 per cent for the move may upset them causing them to cease production. When the ten per cent production level has been reached, the pullets should be handled and the earliest maturing or earlier hatched birds transferred to the laying house. The later maturing or later hatched birds should be left on range to develop further. If there is more than one pen in the laying house, birds of similar maturity should be kept in separate pens. If the birds in the pen are uniform it simplifies the feeding and management routine. After the birds are brought into the house it is advisable to continue the same feeding practice that was used on range for a few days until the birds become accustomed to the new quarters.

For the first few weeks after the birds have been transferred to laying quarters every effort should be made to keep them comfortable. In this connection, removing the windows and placing wire netting or screens over the openings will ensure free air movement and cool pens. As the weather turns colder, the windows may be replaced and ventilation provided in the usual manner.

Artificial illumination.—Artificial illumination is used on the laying flock to stimulate egg production. It is usually recommended that one 40-watt bulb, equipped with a reflector, six feet above the litter, be used for each 200 square feet of floor space. In houses up to 24 feet wide a single row of lights is satisfactory, but in houses wider than this a double row of lights should be used.

The use of sufficient artificial light to give the birds a thirteen to fourteen hour light day is usually started in the fall when the pullets reach their peak of production and is continued through until spring when the lengthening of the hours of daylight eliminates

their need. In addition to using artificial light to stimulate winter production, lights should also be employed at the end of the laying year to increase production, and following the annual moult to bring layers back into production.

There are several systems of using lights. Some operators use morning lights, some evening lights, some morning and evening lights and others the lunch system. In the morning and evening system, bright lights are turned on at about 6 a.m. and off at daybreak. They are turned on again at dusk and off at about 7 p.m. when dim lights are turned on for fifteen to thirty minutes. In the lunch system, bright lights are turned on for about one hour at 9 p.m. to be followed by dim lights for fifteen to thirty minutes.

Dubbing and debeaking.—Many operators improve the performance of their laying or breeding flocks by adopting techniques such as dubbing and debeaking.

Dubbing refers to the removal of the comb and wattles from the birds. This has been an accepted practice with male birds in order to prevent freezing of the combs with resultant loss in vigor and ability to fertilize eggs. In the case of pullets, dubbing has been shown to increase production even when freezing was not a problem. Dubbing is a simple operation which can be done with a pair of scissors or a straight razor. Care should be taken to avoid cutting the comb and wattles off too close. The age at which the operation is performed varies. In most instances it should be done well in advance of the time that the birds are brought into the laying house.

Debeaking is another practice that is followed on many farms to reduce losses from cannibalism and to improve the performance of the birds. The operation is easily performed and consists of removing the tip of the upper beak. In the case of four-week-old chicks light debeaking may be practised while in the case of ready-to-lay pullets or mature chickens about one-quarter inch of the upper beak may be removed. Most debeaking is done with electric debeakers, which cauterize as they cut.

Feeding of the Laying Flock

A number of methods of feeding the laying flock are available. In general they fall into three categories:

(1) the all-mash system
(2) the mash-grain system
(3) the concentrate-grain system.

The method of feeding adopted is not of too great importance provided the ration contains an adequate level of required nutrients and the birds consume enough feed.

The all-mash system.—The all-mash system is perhaps the easiest method of feeding. In this system all of the ingredients are mixed in the ground form into a feed calculated to meet the birds' requirements. No whole grain is fed. Under this system the birds are required to eat what is given to them. There is little doubt as to the proportion of grain and concentrate that is consumed, as there may be if grain and mash are fed, since an all-mash ration eliminates individual preference by the birds for either mash or grain. As a result yolk color is usually more uniform. In addition, there is less likelihood of hired or unskilled labor making a mistake in feeding the birds.

The chief disadvantages of the all-mash system of feeding are:

(1) All of the ingredients have to be ground.

(2) There is sometimes a tendency for pullets to lose weight on an all-mash ration. This may occur in the fall when the birds come into peak production. If the loss in weight is not checked, some of the birds are likely to go into a pause. The weight loss is apparently caused by insufficient energy intake by the birds. This may be remedied by increasing the proportion of high energy feeds such as wheat or corn and by decreasing the proportion of oats, barley and mill by-products in the laying ration. The seriousness of weight loss in pullets cannot be overemphasized. If a poultryman uses this system, he should keep a careful check on the weight of the birds, and make changes in the ration if the birds begin to lose weight.

(3) The litter and dropping boards tend to be wetter when an all-mash ration is fed than when a mash-grain or concentrate-grain system of feeding is used.

The mash-grain system.—The mash-grain system is used most commonly in feeding poultry. The system involves feeding a laying mash (usually about 18% protein) with scratch grain. Laying mash may be purchased ready-mixed or may be made by mixing 100 lb. of 35% laying mash concentrate with 300 lb. of ground grain (150 lb. ground wheat, 75 lb. ground oats and 75 lb. ground barley).

The mash-grain system has been modified in many ways. The amount of protein in the mash may be varied and as a consequence the proportion of mash to scratch grain fed varies. The amount of mash and grain fed may be restricted or fed free choice. The grain may be fed in hoppers or in the litter. For the most part, free choice feeding of an 18% protein laying mash and limiting the amount of scratch grain fed is the most popular modification. This tends to prevent over-eating of grain. Excessive consumption of grain may contribute to obesity, particularly in the heavier breeds. An 18%

protein laying mash is formulated so that when it is fed with an equal quantity of scratch grain, the requirements of the birds for protein, minerals (with the exception of calcium) and vitamins are met.

A schedule of feeding that may be used when an 18% laying mash is fed is as follows:

(1) Keep laying mash in front of the birds at all times.

(2) Feed 12 lb. of scratch grain (two parts wheat, one part oats by weight) per 100 Leghorns or 13 lb. per 100 heavies per day. One-third of this amount may be fed in the morning and two-thirds may be fed in the evening about an hour before the birds go to roost.

The concentrate-grain system.—The concentrate-grain system has not been used extensively in feeding laying birds. Recently, there has been increasing interest in this method of feeding. This system is based on the feeding of concentrate (usually pelleted) along with scratch grain. The system permits maximum use of home-grown grains which not only do not have to be ground, but do not need to be hand fed since they may be supplied in self-feeding hoppers.

The main disadvantages of the system are:

(1) Feed efficiency is reduced slightly.

(2) Individual birds may consume different proportions of grain and concentrate resulting in variability in yolk color.

(3) If concentrate and grain are fed in separate hoppers on a free choice basis the birds tend to consume a higher level of protein than is necessary to maintain a high rate of egg production. Since protein is an expensive part of the ration this increases the cost of egg production. This drawback can be overcome by mixing the pelleted concentrate with the whole grain in the proportion desired.

Feed consumption.—The amount of feed required for a laying hen is dependent on a number of factors such as the weight of the bird, the rate of egg production and the energy content of the feed. A certain amount of feed is required to maintain a bird whether it is laying or not. In general, the larger the bird the more feed is required to take care of the requirement for maintenance. Rate of egg production, too, has a marked influence on feed requirement. As the rate of production increases, extra feed, above that required for maintenance, is needed for egg formation.

The feed requirements of hens of different weights at various levels of production is shown in the following table taken from a publication entitled "The Nutrient Requirements for Poultry" published by the National Research Council (U.S.).

Feed Required by Chickens of Different Live Weight for Maintenance and for the Production of 0, 100, 200 and 300 Eggs Respectively Per Year

Av. live weight	Average Total Feed Required per Bird per Year for Maintenance and the Production of the Indicated Number of Eggs			
	0 eggs per year	100 eggs per year	200 eggs per year	300 eggs per year
lb.	lb.	lb.	lb.	lb.
3.0	47	61	75	89
3.5	52	67	81	95
4.0	57	71	85	99
4.5	61	75	89	104
5.0	65	80	94	108
5.5	70	84	98	112
6.0	74	88	102	116
6.5	78	92	106	120
7.0	81	96	110	124

This table shows clearly that feed consumption is greatly influenced by the average weight of the birds as well as by the rate at which they produce. The consumption figures given in this table should be used only as a guide. They will vary depending on the amount of feed wastage and the energy content of the feed. In the latter regard it has been shown that feed required per bird per day is more or less directly related to the productive energy content of the ration. Thus, on high energy rations (rations high in wheat and low in oat and barley content) proportionately less feed is eaten than on lower energy rations (rations low in wheat and high in oat and barley content). This is a factor that may be of considerable practical importance to the producer. A high energy feed, even though more expensive per pound, may result in lower production costs than can be obtained on a low energy feed. Value of a feed should not be based on the cost per ton, but rather on the cost of feed required to produce a unit of product, such as a dozen eggs or a pound of poultry meat.

Culling the Laying Flock

Culling the flock is one of the most important activities on a poultry farm. Culling removes sick birds and poor producers and so increases the average quality of the birds that are kept. It reduces the amount of feed required to produce a dozen eggs and thus improves the efficiency of production.

Two types of culling may be used on a poultry farm. The first might be termed continuous culling and refers to the removal throughout the laying year of obviously sick birds and those definitely out of production. The second type is systematic culling. In systematic culling the birds are crated, handled and the culls are removed. This entails a good deal of labor. As a result, this type of

culling is usually only used a few times during the laying year. If a good strain of chickens is obtained, and only good quality birds are put into the laying house, systematic culling should not be necessary until the birds have been laying for 8 months. Monthly culling may then be necessary until the end of the laying year. By following such a culling program and by feeding and managing the laying flock properly, production of the order of 200 eggs per bird housed should be obtained.

Maintaining Egg Quality

In order to ensure high returns from an egg production program it is essential that eggs of high quality be produced and that the quality be maintained until the eggs reach the consumer. A number of factors in feeding and management should be given attention in a program to produce eggs of high quality. These factors are as follows:

(1) If possible, obtain a breed or strain of birds that is known to lay eggs with a low incidence of blood and meat spots. Generally speaking, Leghorns produce fewer blood and meat spot eggs than certain of the heavy breeds.

(2) Feed a balanced laying ration. Oyster shell should be supplied free choice in order to ensure the production of eggs of good shell quality.

(3) Keep the laying flock confined. Birds that are allowed to range at large tend to consume too much green feed and as a result lay eggs with dark yolks. Such eggs are often graded down and are objectionable to the consumer.

(4) Do not have males in the pens except during the breeding season. The germinal discs (referred to as germ spots) of fertile eggs undergo development on exposure to high temperatures. Such eggs grade down when candled.

(5) Produce clean eggs. This may be accomplished by keeping nests and pens clean and by gathering the eggs at least three times a day. Eggs should not be washed on the farm. Dirt or stains may be removed by brushing the eggs with sandpaper or fine steel wool.

Eggs lose their quality if they are not properly cared for after they are laid. Several factors contribute to the loss in quality. Among these, the most important are age, temperature and humidity of the storage, exposure to odors, and care exercised in handling.

As eggs age there is loss of quality regardless of the storage conditions. For this reason eggs should be marketed often; twice weekly marketings are recommended.

Quality losses are modified by the storage conditions to which eggs are subjected. At high temperatures, interior quality is rapidly lost whereas at low temperatures the rate of quality loss is reduced. For this reason eggs should be gathered in wire baskets and cooled as quickly as possible after they are laid. It is recommended that they be held at 50° to 55°F. until they are taken to market.

Humidity during storage also influences the quality of eggs. At higher relative humidities the rate of loss of moisture from eggs is less than when the relative humidity is low. Loss of moisture is reflected in air cell size which is one of the factors used to assess the quality and grade of eggs. A relative humidity of 60 to 70 per cent in egg rooms is recommended.

Eggs readily take on odors. As a consequence, egg rooms should be free of vegetable, coal oil, musty or other odors.

The type of handling to which eggs are subjected can cause a loss in quality. Rough handling may result in cracked or broken shells, loose air cells, or a decrease in interior quality, all of which cause lower grade returns.

THE HATCHING-EGG FLOCK

In general, the feeding and management of the hatching-egg flock is similar to that outlined for the laying flock. Certain aspects, however, should be given additional attention.

Costs Involved in Hatching-Egg Production

It costs more to produce eggs for hatching purposes than it does for commercial sales. Before going into hatching-egg production, it is advisable to consider some of the items that add to the cost and to calculate the premium that is necessary in order to make this phase of the production program a success. The principal items of extra cost are as follows:

(1) Cost of banding and blood-testing breeders. This should include the blood-test fee and loss resulting from birds being culled for defects and disqualifications which would not interfere with their ability to produce market eggs.

(2) Extra cost of breeding mash as compared to laying mash.

(3) Cost of males. The cost of males, whether purchased or raised on the premises, is one of the major items to consider in the extra cost of producing hatching eggs. If males are purchased a cash outlay must be made. They occupy as much floor space and consume at least as much feed as the same number of pullets. Therefore, in determining the cost of males, in addition to the purchase price of the males less their salvage value at the end of the season,

one should add the value of the eggs that a like number of pullets would have produced.

(4) Risk. In addition to the foregoing items, one should also include risk as a cost item. Risk involved in the hatching-egg business includes such things as disease, production rate during the hatching season, percentage hatch and length of hatching season. The risk involved in these items usually occurs after the flock has been tested and males have been obtained and hence is a real factor of cost.

The occurrence of disease in the flock prior to, or during the hatching season, may be costly to the hatching-egg producer. Disease may result in mortality and a marked decline in the rate of production. If danger of transmission of disease exists it may be necessary to discontinue shipping eggs to the hatchery. The net result is loss of the premium that is necessary to meet the extra costs of producing hatching eggs.

Production rate during the hatching season is also of great importance. If the birds fail to lay a sufficient number of eggs during the hatching season, whether because of disease, feeding or management, it will not be possible to defray the extra costs involved in keeping a hatching-egg flock. In order to counteract the chance of low production during the hatching season some operators attempt to hold back production until the beginning of the hatching season. By doing this they lose the benefit from the sale of eggs during the fall period, when the price of commercial eggs is usually high. This in turn necessitates a higher premium for hatching eggs than would be necessary if the fall and winter rate of egg production were kept at a high level.

Percentage hatch is very important in the production of hatching eggs. Payment for eggs is often based on the per cent hatch of the eggs. In other instances hatching eggs are bought on a flat-rate basis, but the hatcheryman frequently takes into account the percentage hatch in the previous season in arriving at a suitable flat-rate price. Since percentage hatch is influenced by many factors such as strain, feeding, management and selection and care of eggs, the hatching-egg shipper should make every effort to give these factors the attention they deserve.

Length of hatching season is of necessity related to incubator capacity, hatching-egg supply and market for the chicks. If a producer can obtain a long hatching season, the premium that he needs to meet the extra costs of producing hatching eggs is less than in a short season. The length of hatching season offered should be

considered as carefully as the premium offered when deciding whether to go into the hatching-egg business.

(5) Still another item that should be considered is the strain or breed of bird kept. It is possible that the strain kept for hatching egg production may not be the same as one would keep for the production of commercial eggs. The hatching-egg market may demand breeds or strains that do not possess the productive ability, feed efficiency or livability of strains that might be kept for market egg production. All such factors should be kept in mind when assessing the attractiveness of the hatching-egg business.

Feeding and Management of the Hatching-Egg Flock

Feeding.—The hatching-egg flock should be fed a breeding ration rather than a laying ration. Breeding rations are formulated to meet the nutritional requirements of breeders which are higher than those of layers. As a general rule it is recommended that feeding of the breeding ration should commence about 6 weeks prior to the breeding season and continue throughout the breeding season. Any of the systems of feeding referred to under the feeding of laying birds may be followed; however, the best control of nutrient intake is obtained by following the all-mash method of feeding and this system is therefore recommended.

Fertility.—In order to obtain a high percentage hatch, good fertility is necessary. To obtain good fertility, strong vigorous cockerels should be used in the breeding pens. In addition, care should be exercised to see that the males do not get their combs frozen as this will result in low fertility (see Dubbing and Debeaking). In flock matings, one male for 18 to 20 females in the case of Leghorns and one male for 12 to 15 females in the case of heavy breeds is considered to be adequate.

The males should be placed in the pens about ten days before eggs are to be collected for hatching purposes. They may be removed a week before the end of the hatching season without loss of fertility.

Care of hatching eggs.—Hatching eggs are handled in much the same manner as market eggs. The main points that should be observed are as follows:

(1) Collect eggs three or four times a day and cool quickly to 50° to 55°F.

(2) Do not wash hatching eggs. Dirty eggs may be cleaned with sandpaper or fine steel wool.

(3) Only sound-shelled eggs of suitable size, shape, shell color

and shell quality should be packed for shipment to hatcheries. The eggs should be packed large end up in clean Keyes trays.

(4) Hold hatching eggs on the farm at 50° to 55°F. Every effort should be made to avoid chilling or overheating hatching eggs, since serious chilling or overheating of hatching eggs results in lowered hatchability.

(5) Shipment of hatching eggs to the hatchery should be made twice weekly and every effort made to protect the hatching eggs against freezing during shipment.

(6) Avoid rough handling of hatching eggs since this results in lowered hatchability.

The following publications dealing with poultry production are available.

Bulletin No. 45	"Diseases of Poultry"
Farm Plan No. 1	"Laying House Plan"
Farm Plan No. 2	"Brooder House"
Farm Plan No. 3	"Range Shelter"
Farm Plan No. 4	"Poultry Equipment"

The above publications may be obtained from:

(1) Department of Extension, University of Alberta, Edmonton, Alberta.

(2) Department of Animal Science, University of Alberta, Edmonton, Alberta.

(3) Poultry Branch, Department of Agriculture, Government of Alberta, Edmonton.

(4) The District Agriculturist.